

## PATENT ABSTRACTS OF JAPAN

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H01G 4/38

H01G 4/12

(21)Application number : 2001-215145

(71)Applicant : TDK CORP

(22)Date of filing : 16.07.2001

(72)Inventor : ABIKO TAISUKE

MASUDA ATSUSHI

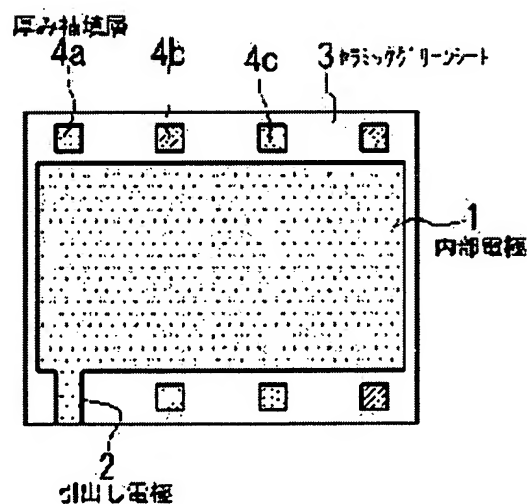
TOGASHI MASAOKI

(54) LAMINATED CERAMIC ELECTRONIC COMPONENT WITH MULTIPLE TERMINALS

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent recess on ceramic layers and maintain bonding strength of the ceramic layers by providing a layer for compensation of sheet thickness.

SOLUTION: A ceramic element is made of ceramic sheets 3. On the other surface of a ceramic green sheet 3 where a lead electrode 2 is not provided, sheet thickness compensation layers 4a, 4b, 4c,... are aligned with lead electrodes provided on the surfaces of other ceramic sheets, and formed into a rectangular shape separately from an internal electrode 1 and the lead electrode 2.



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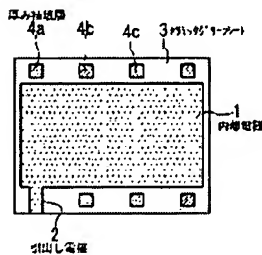
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## CLAIMS

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[Claim(s)]

[Claim 1] The internal electrode containing the cash-drawer electrode derived crosswise [ of the body of components ] from an internal electrode is prepared on the field of a ceramic green sheet. In the many-items child type laminating ceramic electronic parts which are made to carry out two or more laminatings of that ceramic green sheet to an internal electrode by turns, form a laminating ceramic element assembly and use this laminating ceramic element assembly as the body of components In respect of the remainder of the ceramic green sheet with which a cash-drawer electrode is not prepared, alignment is carried out to the cash-drawer electrode prepared in the field of other ceramic green sheets. Many-items child type laminating ceramic electronic parts characterized by coming to form a ceramic element assembly from the ceramic green sheet which pulled out the supplementation layer of sheet thickness in the internal electrode list, was made to separate with an electrode, and was prepared in the shape of [ of this thickness ] a rectangle.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention prepares the internal electrode containing the cash-drawer electrode derived crosswise [ of the body of components ] from an internal electrode on the field of a ceramic green sheet, carries out two or more laminatings of that ceramic green sheet to an internal electrode by turns, forms a laminating ceramic element assembly, and relates to the many-items child type laminating ceramic electronic parts which use this laminating ceramic element assembly as the body of components.

[0002]

[Description of the Prior Art] The group of a ceramic green sheet (not shown) which formed crosswise the cash-drawer electrodes 2a-2d derived respectively from an internal electrodes [ as shown by drawing 4 / 1a-1d ] different location when the many-items child type stacked type ceramic condenser was illustrated, internal electrode 1a as shown by drawing 5 -- there are some which are constituted in 8 terminal molds by carrying out the laminating of the group of a ceramic green sheet which prepared 'cash-drawer electrode 2a'-2d derived from the location where -1d' differs'.

[0003] In the stacked type ceramic condenser, the ceramic bed depth of crosswise both-sides approach pulls out, and it becomes half by the thickness of an electrode, and as drawing 6 shows, while the ceramic layer of both-sides approach carries out invagination from the place where the consistency of the ceramic layer concerned is low with pressurization sticking by pressure given

behind the laminating of a ceramic green sheet, a cash-drawer electrode will distort and fall. For this reason, the structure defect by the crack of a ceramic layer, open circuit of an opening or a cash-drawer electrode, etc. arises with baking processing of a laminating ceramic element assembly.

[0004] In the stacked type ceramic condenser of 2 terminal molds which prepare an external electrode in the both ends of a laminating ceramic element assembly in order to prevent the invagination of the ceramic layer, making the supplementation layer (dummy electrode) of sheet thickness separate into both \*\*\*\* of an internal electrode from an internal electrode and the conductive paste of this quality of the material, and preparing in band-like is proposed (JP,3-59627,U).

[0005] Since this supplementation layer is what presents band-like [ covering the longitudinal direction abbreviation overall length of a laminating ceramic element assembly ] although the invagination of a ceramic layer can be prevented when the supplementation layer of that sheet thickness is applied, the plane-of-composition product between ceramic green sheets is lessened, and there is a possibility of producing interlaminar peeling from a place fully unjoinable even if it performs sticking-by-pressure processing behind the laminating of a ceramic green sheet.

[0006]

[Problem(s) to be Solved by the Invention] This invention aims at offering the many-items child type laminating ceramic electronic parts which can fully maintain the bonding strength of a ceramic layer while it prepares the supplementation layer of sheet thickness and prevents the invagination of a ceramic layer.

[0007]

[Means for Solving the Problem] In the many-items child type laminating ceramic electronic parts concerning this invention, it is the residual side of a ceramic green sheet in which a cash-drawer electrode is not prepared, and alignment is carried out to the cash-drawer electrode prepared in the field of other ceramic

green sheets, and it is constituted by forming a ceramic element assembly from the ceramic green sheet which pulled out the supplementation layer of sheet thickness in the internal electrode list, was made to separate with an electrode, and was prepared in the shape of [ of this thickness ] a rectangle.

[0008]

[Embodiment of the Invention] Hereafter, when it explains with reference to drawing 1 - drawing 3 , the gestalt of illustration implementation shows the case where the stacked type ceramic condenser of 8 terminal molds is constituted as drawing 1 shows. This ceramic condenser is constituted by using as the body of components the laminating ceramic element assembly 10 which was made to carry out two or more laminatings of the ceramic green sheet of eight layers which prepared the internal electrode which pulls out from a respectively different location similarly and derives an electrode, and formed it, if drawing 5 shows to the drawing 4 list.

[0009] If the production process is explained roughly, the ceramic green sheet of a large area for components two or more picking will be produced from the ceramic paste applied on the field of a carrier tape. The internal electrode containing the cash-drawer electrode derived crosswise [ of the body of components ] from an internal electrode since a conductive paste is printed on the field of a ceramic green sheet is formed after desiccation of this ceramic green sheet. The ceramic green sheet is cut out to the predetermined die length after desiccation, and the ceramic green sheet with which two or more internal electrodes were prepared is obtained as an initial stage.

[0010] If the ceramic sheet is used, the laminating ceramic chip element assembly used as the body of components is produced by carrying out two or more laminatings, producing the ceramic layered product for components plurality picking so that it may become an internal electrode and by turns, and carrying out after [ cutting ] baking processing of this per components. At a final process, they are eight external electrodes 11a and 11b. -- It is constituted as a stacked type ceramic condenser of 8 terminal molds by making it connect with



the cash-drawer electrode exposed to the edge aspect of a laminating ceramic element assembly electrically, and preparing.

[0011] In the production process, in case printing formation of the internal electrode 1 which is shown by drawing 1 (it illustrates by one pattern) and which pulls out like and contains an electrode 2 is carried out on the field of the ceramic green sheet 3 with a conductive paste, printing formation of supplementation layer 4a-- of sheet thickness is carried out from the same conductive paste.

These supplementation layers 4a and 4b and 4c-- are the residual sides of the ceramic green sheet 3 in which the cash-drawer electrode 2 is not formed, they carry out alignment to the cash-drawer electrode (it is referring to drawing 5 to the drawing 4 list) prepared in the field of other ceramic green sheets, and you pull them out in internal electrode 1 list, make it dissociate with an electrode 2, and are formed in the shape of [ of this thickness ] a rectangle.

[0012] If the laminating of the supplementation layers 4a and 4b of the sheet thickness and the ceramic green sheet 3 which prepared 4c-- is carried out to an internal electrode 2 by turns and a ceramic layer is formed, since the thickness supplementation layers 4a and 4b and 4c-- join the ceramic layer of both-sides approach, it will become equivalent to the central thickness which carries out the laminating of the internal electrode 2. Moreover, since the supplementation layers 4a and 4b and 4c-- carry out alignment to the cash-drawer electrode prepared in the field of other ceramic green sheets and are formed in the shape of a rectangle, the plane-of-composition product between ceramic green sheets can also fully be maintained.

[0013] In the many-items child type stacked type ceramic condenser which forms a ceramic layer from the ceramic green sheet which prepared the supplementation layer of the sheet thickness, since both-sides approach and central thickness are equivalent, it can stop that the ceramic layer of both-sides approach carries out invagination with pressurization sticking by pressure given behind the laminating of a ceramic green sheet. Moreover, since the plane-of-composition product between ceramic green sheets can also fully be maintained,

as drawing 3 shows, with the crack of a ceramic layer, and an open circuit of an opening or a cash-drawer electrode, structure defects, such as interlaminar peeling by poor junction of a ceramic layer, can be prevented, and improvement in the production yield can also be aimed at.

[0014] The gestalt of operation mentioned above is applicable like the many-items child type laminating ceramic condenser for three-dimensions loading of the type which derives a cash-drawer electrode to neighboring each part in addition to this etc., although explained based on the stacked type ceramic condenser of 8 terminal molds with which a cash-drawer electrode is drawn crosswise [ of the body of components ].

[0015]

[Effect of the Invention] If it depends on the many-items child type laminating ceramic electronic parts built over this invention like the above, in respect of the remainder of the ceramic green sheet with which a cash-drawer electrode is not prepared Alignment is carried out to the cash-drawer electrode prepared in the field of other ceramic green sheets. By forming a ceramic element assembly from the ceramic green sheet which pulled out the supplementation layer of sheet thickness in the internal electrode list, was made to separate with an electrode, and was prepared in the shape of [ of this thickness ] a rectangle Since it can stop that the ceramic layer of both-sides approach carries out invagination with pressurization sticking by pressure given behind the laminating of a ceramic green sheet and the plane-of-composition product between ceramic green sheets can also fully be maintained, With the crack of a ceramic layer, and an open circuit of an opening or a cash-drawer electrode, generating of the structure defect by poor junction of a ceramic layer can be prevented, and improvement in the production yield can be aimed at.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the top view showing the many-items child type stacked type ceramic condenser concerning the gestalt of 1 operation of this invention.

[Drawing 2] It is the explanatory view showing the ceramic green sheet which prepared the supplementation layer of sheet thickness in the internal electrode list containing the cash-drawer electrode which constitutes the stacked type ceramic condenser of drawing 1 .

[Drawing 3] It is the sectional view showing the body of components of the laminating ceramic electronic parts concerning this invention with a microphotography.

[Drawing 4] a group which constitutes 8 terminal mold laminating ceramic condenser concerning a general example -- it is the explanatory view showing an internal electrode.

[Drawing 5] It is the explanatory view showing the internal electrode of the group of drawing 4 , and another group by which a laminating is carried out.

[Drawing 6] It is the sectional view showing the body of components of the laminating ceramic electronic parts concerning the conventional example with a microphotography.

[Description of Notations]

1 Internal Electrode

2 Cash-Drawer Electrode

3 Ceramic Green Sheet

4a, 4b, 4c-- Supplementation layer of sheet thickness

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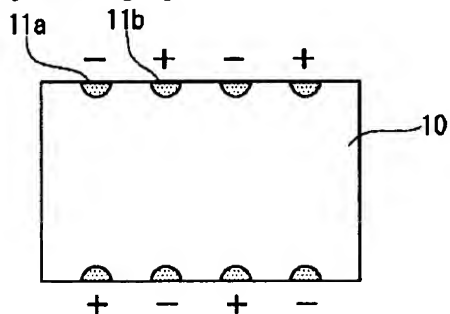
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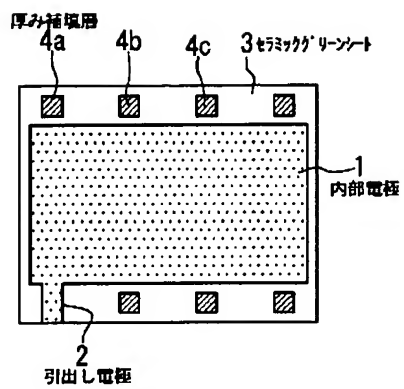
DRAWINGS

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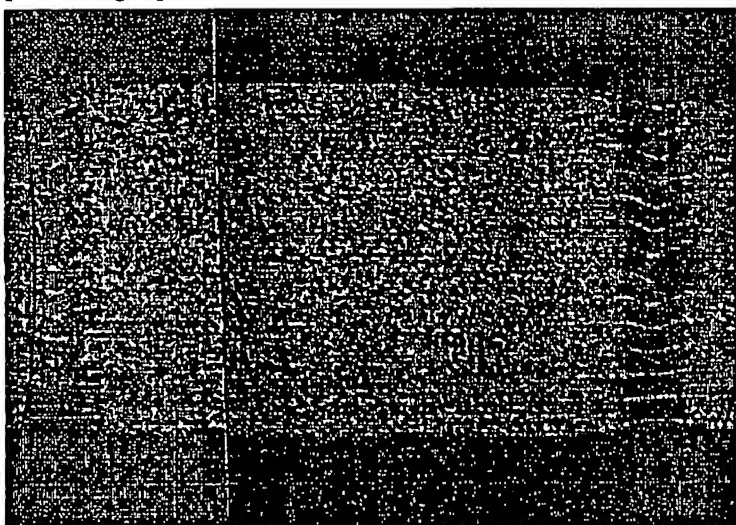
[Drawing 1]



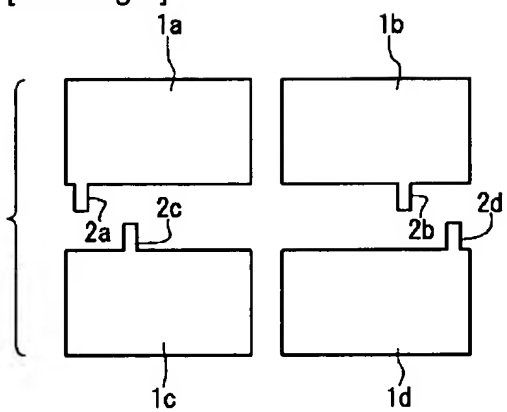
[Drawing 2]



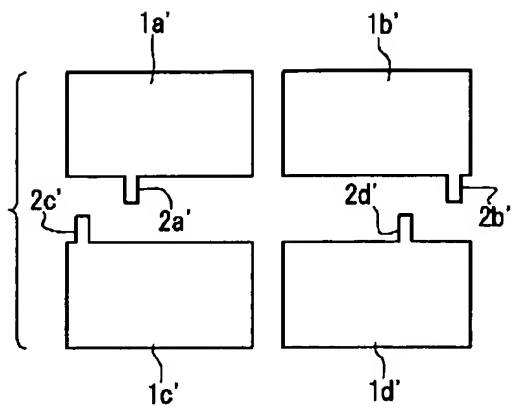
[Drawing 3]



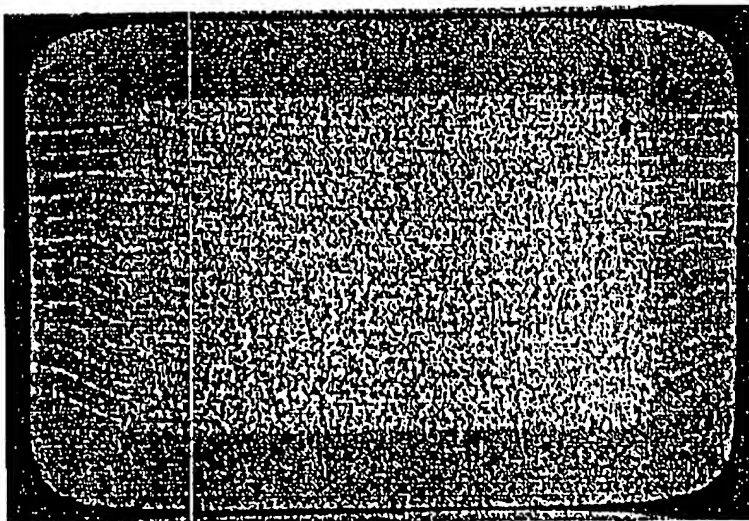
[Drawing 4]



[Drawing 5]



[Drawing 6]



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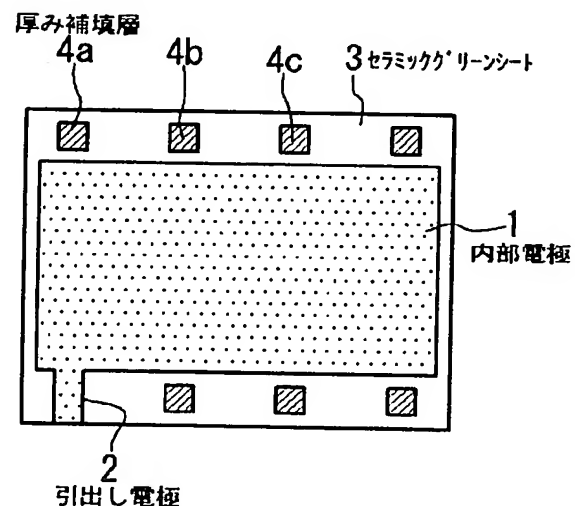
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(54)【発明の名称】 多端子型の積層セラミック電子部品

(57)【要約】

【課題】 シート厚みの補填層を設け、セラミック層の陥入を防ぐと共に、セラミック層の接合強度を保つ。

【解決手段】 引出し電極2が設けられないセラミックグリーンシート3の残余面で、他のセラミックグリーンシートの面内に設けられる引出し電極と位置合わせし、シート厚みの補填層4a、4b、4c…を内部電極1並びに引出し電極2と分離させて同厚みの方形状に設けたセラミックグリーンシート3からセラミック素体を形成する。



## 【特許請求の範囲】

【請求項1】 内部電極より部品本体の幅方向に導出する引出し電極を含む内部電極をセラミックグリーンシートの面上に設け、そのセラミックグリーンシートを内部電極と交互に複数積層させて積層セラミック素体を形成し、この積層セラミック素体を部品本体とする多端子型の積層セラミック電子部品において、引出し電極が設けられないセラミックグリーンシートの残余面で、他のセラミックグリーンシートの面内に設けられる引出し電極と位置合わせし、シート厚みの補填層を内部電極並びに引出し電極と分離させて同厚みの方形状に設けたセラミックグリーンシートからセラミック素体を形成してなることを特徴とする多端子型の積層セラミック電子部品。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、内部電極より部品本体の幅方向に導出する引出し電極を含む内部電極をセラミックグリーンシートの面上に設け、そのセラミックグリーンシートを内部電極と交互に複数積層させて積層セラミック素体を形成し、この積層セラミック素体を部品本体とする多端子型の積層セラミック電子部品に関するものである。

## 【0002】

【従来の技術】多端子型の積層セラミックコンデンサを例示すると、図4で示すような内部電極1a～1dの異なる位置から幅方向に各々導出する引出し電極2a～2dを設けたセラミックグリーンシート（図示せず）の群と、図5で示すような内部電極1a'～1d'の異なる位置から導出する引出し電極2a'～2d'を設けたセラミックグリーンシートの群とを積層することにより八端子型に構成するものがある。

【0003】その積層セラミックコンデンサにおいては、幅方向両側寄りのセラミック層厚みが引出し電極の厚み分だけ半分となり、当該セラミック層の密度が低いところから、セラミックグリーンシートの積層後に施す加圧圧着に伴って、図6で示すように両側寄りのセラミック層が陥入すると共に、引出し電極がひずんで落ち込んでしまう。このため、積層セラミック素体の焼成処理に伴って、セラミック層のクラックや空隙或いは引出し電極の断線等による構造欠陥が生ずる。

【0004】そのセラミック層の陥入を防ぐべく、外部電極を積層セラミック素体の両端に設ける2端子型の積層セラミックコンデンサにおいては、内部電極と同材質の導電性ペーストからシート厚みの補填層（ダミー電極）を内部電極の両脇部に分離させて帯状に設けることが提案されている（実開平3-59627号）。

【0005】そのシート厚みの補填層を適用すると、セラミック層の陥入は防げるが、この補填層が積層セラミック素体の長手方向略全長に亘る帯状を呈するものであ

るため、セラミックグリーンシート相互の接合面積を少なくし、セラミックグリーンシートの積層後に圧着処理を施しても十分に接合できないところから層間剥離を生ずる虞れがある。

## 【0006】

【発明が解決しようとする課題】本発明は、シート厚みの補填層を設け、セラミック層の陥入を防ぐと共に、セラミック層の接合強度を十分に保てる多端子型の積層セラミック電子部品を提供することを目的とする。

## 【0007】

【課題を解決するための手段】本発明に係る多端子型の積層セラミック電子部品においては、引出し電極が設けられないセラミックグリーンシートの残余面で、他のセラミックグリーンシートの面内に設けられる引出し電極と位置合わせし、シート厚みの補填層を内部電極並びに引出し電極と分離させて同厚みの方形状に設けたセラミックグリーンシートからセラミック素体を形成することにより構成されている。

## 【0008】

【発明の実施の形態】以下、図1～図3を参照して説明すると、図示実施の形態は、図1で示すように8端子型の積層セラミックコンデンサを構成する場合を示す。このセラミックコンデンサは、図4並びに図5で示すと同様に、各々異なる位置から引出し電極を導出する内部電極を設けた8層のセラミックグリーンシートを複数積層させて形成した積層セラミック素体10を部品本体とすることにより構成されている。

【0009】その製造工程を概略的に説明すると、キャリアテープの面上に塗布するセラミックペーストから部品複数取り用の広い面積のセラミックグリーンシートを作製し、このセラミックグリーンシートの乾燥後、導電性ペーストをセラミックグリーンシートの面上に印刷することから内部電極より部品本体の幅方向に導出する引出し電極を含む内部電極を形成し、そのセラミックグリーンシートを乾燥後所定長さに裁断し、複数個の内部電極が設けられたセラミックグリーンシートを初期段階として得る。

【0010】そのセラミックシートを用いては、内部電極と交互になるよう複数積層させて部品複数個取り用のセラミック積層体を作製し、これを部品単位に切断後焼成処理することにより、部品本体となる積層セラミックチップ素体を作製する。最終工程で、8個の外部電極11a、11b…積層セラミック素体の端部面に露出する引出し電極と電気的に接続させて設けることにより8端子型の積層セラミックコンデンサとして構成されている。

【0011】その製造工程中で、図1で示す（1バターンで例示）ように引出し電極2を含む内部電極1を導電性ペーストでセラミックグリーンシート3の面上に印刷形成する際に、同じ導電性ペーストからシート厚みの補



填層4a…を印刷形成する。この補填層4a、4b、4c…は、引出し電極2が設けられないセラミックグリーンシート3の残余面で、他のセラミックグリーンシートの面内に設けられる引出し電極(図4並びに図5参照)と位置合わせし、内部電極1並びに引出し電極2と分離させて同厚みの方形状に形成する。

【0012】そのシート厚みの補填層4a、4b、4c…を設けたセラミックグリーンシート3を内部電極2と交互に積層させてセラミック層を形成すると、両側寄りのセラミック層には厚み補填層4a、4b、4c…が加わるから内部電極2を積層する中央厚みと同等となる。また、補填層4a、4b、4c…が他のセラミックグリーンシートの面内に設けられる引出し電極と位置合わせさせて方形状に形成されているため、セラミックグリーンシート相互の接合面積も十分に保てる。

【0013】そのシート厚みの補填層を設けたセラミックグリーンシートからセラミック層を形成する多端子型の積層セラミックコンデンサでは、両側寄りと中央厚みとが同等であるから、セラミックグリーンシートの積層後に施す加圧圧着に伴って、両側寄りのセラミック層が陥入するのを抑えられる。また、セラミックグリーンシート相互の接合面積も十分に保てるため、図3で示すようにセラミック層のクラックや空隙或いは引出し電極の断線と共に、セラミック層の接合不良による層間剥離等の構造欠陥を防げて生産歩留りの向上も図れる。

【0014】上述した実施の形態は、引出し電極が部品本体の幅方向に導出される8端子型の積層セラミックコンデンサに基づいて説明したが、これ以外に、引出し電極を四辺の各部に導出するタイプの三次元搭載用多端子型積層セラミックコンデンサ等にも同様に適用できる。

【0015】

【発明の効果】以上の如く、本発明に係る多端子型の積\*

\*層セラミック電子部品に依れば、引出し電極が設けられないセラミックグリーンシートの残余面で、他のセラミックグリーンシートの面内に設けられる引出し電極と位置合わせし、シート厚みの補填層を内部電極並びに引出し電極と分離させて同厚みの方形状に設けたセラミックグリーンシートからセラミック素体を形成することにより、セラミックグリーンシートの積層後に施す加圧圧着に伴って、両側寄りのセラミック層が陥入するのを抑えられ、また、セラミックグリーンシート相互の接合面積も十分に保てるため、セラミック層のクラックや空隙或いは引出し電極の断線と共に、セラミック層の接合不良等による構造欠陥の発生を防げて生産歩留りの向上を図れる。

【図面の簡単な説明】

【図1】本発明の一実施の形態に係る多端子型の積層セラミックコンデンサを示す平面図である。

【図2】図1の積層セラミックコンデンサを構成する引出し電極を含む内部電極並びにシート厚みの補填層を設けたセラミックグリーンシートを示す説明図である。

【図3】本発明に係る積層セラミック電子部品の部品本体を顕微鏡写真で示す断面図である。

【図4】一般例に係る8端子型積層セラミックコンデンサを構成する一群の内部電極を示す説明図である。

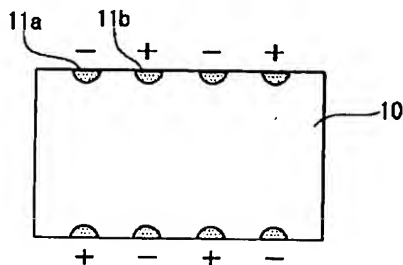
【図5】図4の群と積層される別の群の内部電極を示す説明図である。

【図6】従来例に係る積層セラミック電子部品の部品本体を顕微鏡写真で示す断面図である。

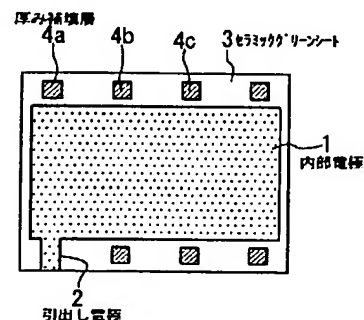
【符号の説明】

- |           |              |
|-----------|--------------|
| 1         | 内部電極         |
| 2         | 引出し電極        |
| 3         | セラミックグリーンシート |
| 4a、4b、4c… | シート厚みの補填層    |

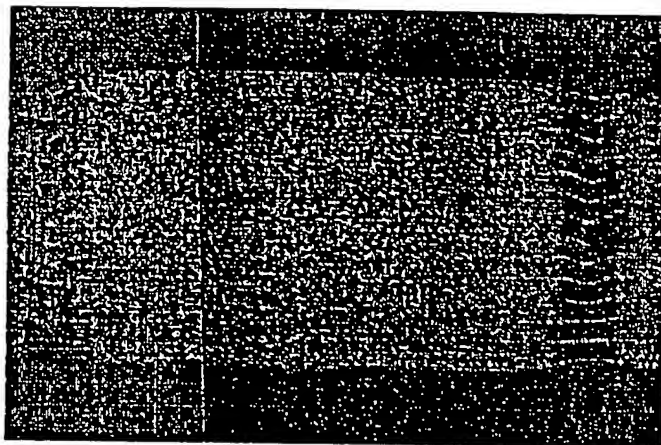
【図1】



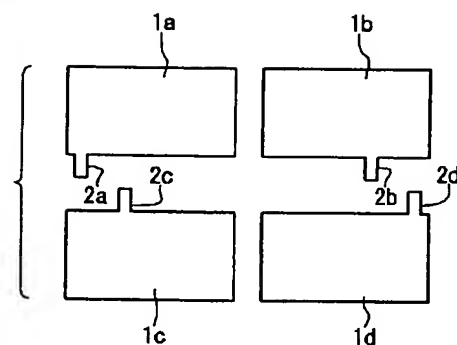
【図2】



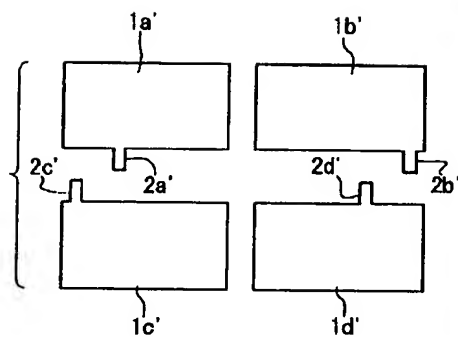
【図3】



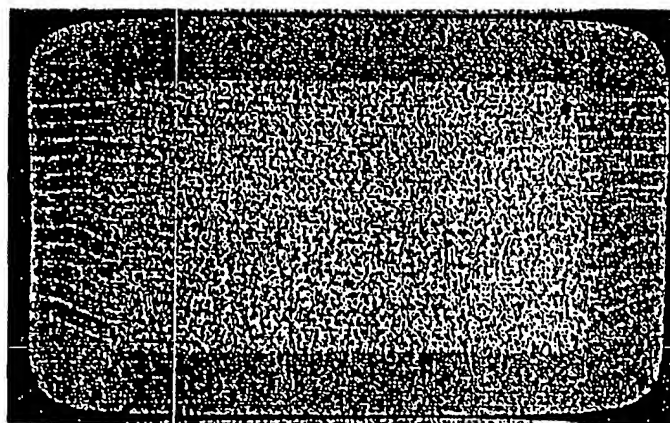
【図4】



【図5】



【図6】



フロントページの続き

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